

Sero-Prevalence of Major Transfusion-Transmitted Infections (TTIS) Among Blood Donors Of Nnewi, Southeastern Nigeria

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Abstract

Background: The field of transfusion medicine has encountered a huge problem in providing safe blood and blood products; therefore there is a need to improve testing for Transfusion transmitted Diseases (TTDs) and the selection of blood donors.

Objective: The objective of the present study was to estimate the prevalence of TTIs among healthy blood donors.

Methods: A total of 12,326 healthy blood donors reporting to our blood bank in Nnamdi Azikiwe University Teaching Hospital, Nnewi, were screened for Hepatitis B surface Antigen (HBsAg), Hepatitis C virus (HCV), Human Immunodeficiency virus (HIV) and Venereal Disease Research Laboratories (VDRL) tests.

Results: A total of 12,326 healthy blood donors aged 18-60 years were screened for TTIs. Out of these 333 donors (2.7%) were seropositive for HBsAg, 219 (1.8%) were seropositive for HIV, 195 (1.6%) were seropositive for HCV and 57 (0.5%) had shown sero positivity for syphilis. More male donors 660 (5.4%) were infected with TTIs than female donors 144 (1.2%). The prevalence of TTIs in this study showed higher prevalence among donors 18 – 40 years of age (5.3%) compared to 41-60 years of age group. The rate of co infectivity in our study was 0.3% (33/12,326).

Conclusion: This study reflects that blood transfusion is one of the risk factors of spread of TTIs especially in developing countries where rapid test-based screening protocol tends to be used increasingly in blood banks. Therefore, proper donor selection and public awareness campaign targeting communities in poor countries will be an important measure to curb the spread of TTIs through blood transfusion.

Keywords: transfusion; HIV; HBV; HCV; syphilis; seroprevalence

Introduction

The most important transfusion transmittable infections (TTIs) are Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV) and Syphilis. According to World Health Organization, about 2 billion people are living with HBV, 200 million people are infected HCV While 33.4 million are infected with HIV (WHO, 2013; UNAIDS, 2011; WHO, 2012). Blood transfusion carries the risk of transmitting the life threatening transfusion transmissible infections. HIV, hepatitis B, and hepatitis C are major public health problems in developing countries. They are transmitted parentally, vertically, or through high-risk sexual behaviors and can cause fatal acute and chronic life-threatening disorders. Discovery of these hazards brought a dramatic change in attitude of physicians and patients about transfusion of blood (Mujeeb SA, Kausar A, Khalid M, 2000) It is mandatory to test each donor's blood for syphilis by a Venereal

Disease Reference Laboratory (VDRL), and for HBsAg, anti-HCV, and anti-HIV. Transmission of TTIs during the serologically window period still poses a threat to blood safety in environments where there is high rate of TTIs. HBV and HCV are the two established causes of post transfusion hepatitis. There is potential transmission of viruses during the immunological window period (i.e. the period of early infectivity when an immunologic test is non-reactive). These window periods are slightly shorter in case of HIV virus which is the causative agent of AIDS. Blood transfusion is a therapeutic procedure, as there is no genuine substitution. But contaminated blood transfusion can transmit infectious diseases and can be fatal instead of saving life. Safe blood transfusion services are a cornerstone of an effective high quality health care system (Manzoor I, Hashmi N, Daud S, 2009). The aim of this current study was to estimate the Sero-prevalence of transfusion transmitted infections among healthy blood donors at a tertiary healthcare teaching hospital in Nnewi, Nigeria. This knowledge might give us the idea of disease burden of the community and to provide information for relevant polices.

Methodology

Inclusion criteria: Haemoglobin more than 12gm% for both males and females, weight more than 50kg with no history of hepatitis, chronic infections or high risk behaviour.

Exclusion criteria: An exclusion criterion is the pervious history of HBV, HCV and HIV infections. Before screening, all blood donors were subjected to routine physical checkups for exclusion criteria. Apparently unhealthy or malnourished individuals were also refused for blood donations.

Methods

The present study was carried out in the Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria. A total of 12,326 donors were analyzed for the prevalence of Transfusion Transmitted Diseases over a period of four years from January 2007 to December 2010. The participants included replacement donors who donated for ailing family members, close relatives or friends of the recipient. The voluntary donations primarily were obtained from medical and laboratory science students, staff of the hospital, walk in donors, and outdoor blood donation camps. Care was taken to eliminate professional and paid donors by taking history and clinical examination. Basic information regarding age, sex, occupation, number of previous donations was obtained. All samples were screened for hepatitis B surface antigen (HBsAg) and HCV by chromatographic methods. Syphilis was detected by the Venereal disease research laboratory test (VDRL) (Omega Diagnostics Ltd.). All the reactive samples were repeated in duplicate before labeling them seropositive for HBV, HCV and syphilis while HIV test was done according to the national testing algorithm. Only qualified donors were bled to avoid wastage of blood pints. All the tests were performed according to the manufacturers' instructions.

Results

A total of 12,326 donors were screened over the 4 years study period. Male donors 10,055(81.6%) outnumbered female donors 2,271(18.4%). Out of the 12,326 donors screened, 804 (6.5%) had serological evidence of infection with at least one infectious maker. The total number of donors tested for syphilis antibodies were 10,783 because VDRL testing commenced six months later (June) in the blood bank in 2007. The prevalence of HBsAg infection formed the majority 333(2.7%) of the total TTIs screened over the period of study while the prevalence of HIV, HCV and syphilis were 219(1.8%), 195 (1.6%) and 57 (0.5%) respectively. The prevalence of TTIs among donors 18-40 years of age group in this study was 3.5 times (5.3%) higher than those in 41-60 years of age group (1.5%) -table 3. TTIs was more dominant among male donors 660(5.4%) than in female donors 144(1.2%). The donors in age 21-30 years age group had the highest rate of infectivity to HBsAg 122 (1.0%) and HIV (0.7%) but less than 20 years and 31-40

years of age groups had the highest reactivity 58 (0.5% and 18 (0.4%) to HCV and syphilis antibodies respectively. Co-infection was seen in 33/804 (4.1%) of the total transfusion transmitted disease (TTD) positive donors of which 1(0.1%) donor had triple TTIs (HBV, HCV and syphilis) but none of the blood donors reacted to 4 of the TTIs tested for in our study. The highest was found in HBV and HCV co-infection 15 (1.9%).

Table 1. The incidence of TTIs among blood donors for the 4 years of study.

TTI type	2007	2008	2009	2010	Average incidence
HIV	2%	2%	1.5%	1.7%	1.7%
HBV	1.7%	3.3%	2.8%	2.9%	2.7%
HCV	0.8%	2.1%	1.4%	2.1%	1.6%
Syphilis	0.1%	0.2%	0.1%	0.2%	0.5%

Table 2. Sex distribution of TTIs

Sex of Blood donor	Total no screened	No positive for HIV	No positive for HBV	No positive for HCV	No +ve for syphilis
Male	10,055	169 (1.3%)	290 (2.3%)	160 (1.3%)	47 (0.4%)
Female	2,271	59 (0.5%)	43 (0.3%)	35 (0.3%)	16 (0.2%)
Total	12,326	219 (1.8%)	333(2.7%)	195 (1.6%)	57 (0.5%)

Table 3. Age distribution of TTIs among blood donors

Age group	Number positive for HIV	Number positive for HBV	Number positive for HCV	Number positive for syphilis
< 20 years	36(0.3%)	98 (0.8%)	58 (0.5%)	14 (0.1)
21-30	86 (0.7%)	122 (1.0%)	50 (0.4%)	13 (0.1%)
31-40	56 (0.4%)	65 (0.5%)	36 (0.3%)	18 (0.2%)
41-50	25 (0.2%)	32 (0.3%)	30 (0.2%)	6 (0.04%)
51-60	16 (0.1%)	16 (0.1%)	21 (0.2%)	6 (0.04%)
Total	219(1.8%)	333(2.7%)	195(1.6%)	57 (0.5%)

Discussion

Over a decade, our blood bank has successfully shifted from paid and employer –organized donations to voluntary donations, The TTIs studied are endemic and therefore constitute a serious threat to blood safety in Nigeria. To ensure safety, it is critical to monitor ongoing epidemic information, not only from high-risk groups, but also from individuals from the general population such as voluntary blood donors.

Currently, prevention of TTIs depends on proper pre-donation selection of donors and serological testing of infectious markers in those donors. The main objective of our study was to determine the sero-prevalence of TTI's including HIV, HBV, HCV and Syphilis among healthy blood donors of Nnewi, Nigeria.

The total numbers of donors included in this study were around 12,326 and the total prevalence rates of TTI's among those donors was 6.5% This is similar to the 6.9% found by EL-Gilany and EL-Fedawy,(2006) found in 1,257 voluntary donors in Egypt. The prevalence of HIV in this study was 1.8% which is very low compared to many other African countries 2-20% in Kenyan donors (Moore A, et al, 2001) and 5.9% in Ethiopian donors (Sentjens R et al, 2002).Hepatitis B is one of the most infectious disease, it has infected around 2 billion people world- wide, including an estimated 400 million chronically infected cases (Schreiber GB, MP Busch.et al, 1996). It is also hyper endemic in sub-Saharan Africa and Asia (Isselbacher KJ, JR Wands, 1991).

In our study the prevalence rate of HBsAg was 2.7%. This figure is higher than 1.1% found by Ejele et al. (2005) in Niger delta region of Nigeria, and 2.2% found by Bhatii et al.(2007) in Pakistani donors. However, other studies have shown an increased HBV rate for instance 4% in Kenya donors (Abdulla F, Mwanda FO, Rana W,2005) 8.8% in Tanzania donors (Matee MI et al,1999) and 4.3% in Egyptian donors (Alavian SM and Fallahian F,2009).Although there is a slight difference in the rate of HBV among the blood donor categories, the overall HBV rate is very high when compared to the prevalence of HIV, HCV and Syphilis among the same group of donors we studied. In our opinion, the reason behind the high rate of HBV is most probably the high infectivity potential of the virus, immunization status, and cultural practices like circumcision, immunization; tattooing and bloodletting exercise to treat different diseases could expose one to HBV infection.

From this study, the prevalence rate of HCV was 1.6%, this is low when compared to 2.7% in Egypt (EL-Gilany AH and EL-Fedawy, 2006). But it is a bit higher when compared to 0.2% in Kenya (Abdalla F, Mwanda FO, Rana W, 2005) and (Elfaki et al, Elfaki AM, Eldour AA and Elsheikh NM, 2008) found no cases of HCV infection in the 260 Sudanese blood donors they studied. The low prevalence of HCV in our study when compared to HBV might be due to the fact that HCV is less infective when compared to HBV and HCV is transmitted primarily through transfusion of blood or blood products, intravenous drug abuse and needle sharing which are not very common in our setting. The Sero-prevalence of syphilis in this study was 0.5%. This figure is a little higher when compared to 0.2% among blood donors in Niger delta of Nigeria (Erhabor O, Nwoka E, and Adias TC, 2007) and 0% prevalence among Iranian donors (Zohreh A, Mazyar G, Bashir H et al, 2005) Nevertheless, it is very low compared to 7.5% found by Adjei et al. (, 2003) among Ghanaian blood donors and 12.7% found by Matee et al (1999) among Tanzanian donors.

The results of this study and from other studies worldwide suggests an increase in Hepatitis infection yet nothing much is been done for its prevention as greater emphasize are placed on HIV/AIDS prevention and treatments by various government organizations, World Health Organization and UNAIDS. Co-infection was seen in 33/12326 (0.03%) of the total transfusion transmitted disease (TTD) positive donors of which 1(0.01%) donor had triple TTIs (HBV, HCV and syphilis) but none of the blood donors reacted to 4 of the TTIs tested for in our study. The highest was found in HBV and HCV co-infection 15 (1.9%).The mode of transmission of HIV, HBV, and HCV is the same and includes unsafe sexual contact, using sharp materials contaminated with body fluid, mother to child and transfusion of blood and blood products.

The prevalence of TTIs appears to be substantially lower among blood donors than in the general population of Anambra state, Nigeria, because of successfully screening and selection of donors who are at lower risk of infection. Albeit, the current reliance on serology tests, with no Nucleic Acid Technology (NAT) testing for routine donor screening may detect relatively high residual risk compared to serologic method.

Blood banks are important in screening donors of TTIs for recipients' safety as well as determining the disease burdens of HIV, HBV, HCV and syphilis among healthy donors.

Limitations: The study had the following limitations: We did not compare prevalence of TTIs between voluntary and replacement. The test kits used for the screening cannot detect infections in window period as this may have increased the sensitivity of detection. Data was extracted retrospectively.

Recommendations:

The population Seroprevalence of TTIs which potentially threatens the safety of blood supply along with the rising transfusion demands for blood in low income setting should necessitate a widespread implementation of more sensitive donor screening technology-the nucleic acid testing method as a gold choice to detect the residual risk of many TTIs. Further research should be carried out particularly in the implementation of NAT testing of TTIs to ensure blood safety and availability in Nnewi, Nigeria.

Blood donors should first and foremost be properly screened before blood donation to avoid wastage of blood pints; this is the practice in Nnewi, Nigeria.

Conclusion-The HBV rate on both voluntary and replacement donors is very high compared to HIV, HCV, and Syphilis and this needs further investigation including studying the prevalence rate of HBV in the general population to address the issue. Finally even though the prevalence of HIV, HBV, HCV and Syphilis is low, ensuring blood safety has long way to go.

References

- [1]. World Health Organization (WHO) Hepatitis B. Fact sheet Number 204.
- [2]. United Nation Program on HIV/AIDS (UNAIDS). Global Factsheet; World AIDS day getting to Zero.
- [3]. World Health Organization (WHO) Global Health Observatory Data Repository Data on the size of the HIV/AIDS epidemic: Prevalence of HIV 1 among adults.
- [4]. Mujeeb SA, Kausar A, Khalid M. Seroprevalence of HBV, HCV, and HIV infection among college going voluntary donors. *J Pak Med Assoc* 2000; 50:269-70
- [5]. Manzoor I, Hashmi N, Daud S: Seroprevalence of transfusion transmissible infections (TTIS) in blood donors. *Biomedical* 2009, **25**:154-158..
- [6]. EL-Gilany AH and EL-Fedawy. Blood borne infections among student voluntary blood donors in Mansoura University, Egypt. *East Mediterr Health J.* 2006 Nov; 12(6):742-8.
- [7]. Moore A et al. Estimated risk of HIV transmission by blood transfusion in Kenya. *Lancet.* 2001 Aug 25; 358(9282):657-60.
- [8]. Sentjens R et al. Prevalence and risk factors of HIV infection in blood donors and various population subgroups in Ethiopia. *Epidemiol Infect.* 2002 Apr; 128(2):221-8.
- [9]. Schreiber GB, MP Busch, SH Kleinman, JJ Korelitz. The risk of transfusion transmitted viral infections- The retrovirus epidemiology donor study. *N Engl J Med.* 1996 Jun 27; 334(26):1685-90.
- [10]. Isselbacher KJ, JR Wands, 1991. Neoplasms of the Liver, In Harrison's principles of Internal Medicine. 12th Ed. New York
- [11]. Ejele OA, Erhabor O, Nwauche CA. The risk of transfusion-transmissible viral infections in the Niger-Delta area of Nigeria. *Sahel Medical Journal.* 2005; 8(1):16-19
- [12]. Bhatti FA et al. Anti-hepatitis B core antigen testing, viral markers, and occult hepatitis B virus infection in Pakistani blood donors: implication for transfusion practice. *Transfusion.* 2007; 47(1):74-79. This article on PubMed
- [13]. Abdalla F, Mwanda FO, Rana W. Comparing walk-in and call-responsive donors in a national and a private hospital in Nairobi. *East Afr Med J.* 2005 Oct; 82(10):531-5.
- [14]. Matee MI et al. Prevalence of transfusion-associated viral infections and syphilis among blood donors in Muhimbili Medical Centre, Dar es Salaam, Tanzania. *East Afr Med J.* 1999 Mar; 76(3):167-71.
- [15]. Alavian SM and Fallahian F. Epidemiology of Hepatitis C in Iran and the world. *ShirazE-Medical Journal.* Oct-2009;10(4)

- [16]. Elfaki AM, Eldour AA and Elsheikh NM. Sero-prevalence of immunodeficiency virus, hepatitis B and C and syphilis among blood donors at ElObeid Teaching Hospital, West Sudan. *Sudan Journal of Medical Sciences*. 2008;3 (4):333-338
- [17]. Erhabor O, Nwoka E, and Adias TC. Seroprevalence of *Treponema palladium* infection among blood donors in a resource-poor setting in the Niger Delta of Nigeria. *Africa Sanguine*.2007; 10(1):19-21
- [18]. Zohreh A, Mazyar G, Bashir H, Sherun A and Seyed MA. Zero prevalence of syphilis among blood donors in Tehran, Iran. *Transf Today*. 2005; 64:24
- [19]. Adjei AA, Kudzi W, Armah H and Adiku T. Prevalence of antibodies to syphilis among blood donors in Accra, Ghana. *Jpn J Infect Dis*. 2003 Aug; 56(4):165-7.